Method of Test for
DETERMINATION OF DELETERIOUS MATERIALS
DOTD Designation: TR 119-10

I. Scope

This method of test describes the procedure for determining the percentages, by weight, of deleterious materials in aggregate. Deleterious materials consist of wood, clay lumps, friable particles, coal and lignite, flat or elongated particles, glassy particles, and iron ore as defined in Table 1.

II. Apparatus

A. **Balance**
   1. A 30 lb or more capacity balance sensitive to 0.01 lb for determining the percent wood and clay lumps.
   2. A 2 kg or more capacity balance sensitive to 0.1 g for determining the other types of deleterious materials.

B. **Oven –** An oven capable of maintaining a temperature of 230 ± 9°F (110 ± 5°C).

C. **Sieves** - Nos. 4 and 16 sieves

D. **Sample Pans** – Rust-resistant pans of a size and shape that will permit the spreading of the sample on the bottom in a thin layer.

E. **Deleterious Materials in Aggregate Worksheet** – DOTD 03-22-0746 (Figure 1)

F. **Aggregate Test Report** – DOTD 03-22-0745 (Figure 2)

III. Sample

A. Wood and Clay Lumps: One full sample sack of material.

B. Other Deleterious Materials:
   1. Coarse Aggregate – Representative portion of approximately 2000 g of material retained on the No. 4 sieve.
   2. Fine Aggregate – Representative portion of a minimum of 500 g of material retained on the No. 16 sieve.

IV. Procedure

A. Wood and Clay Lumps
   1. Pour the undried sample into a tared sample pan and record the total wet weight of the sample as T_W.
   2. By visual inspection, remove all particles of wood (sticks, bark, etc.) and clay lumps from the sample.
   3. Place the removed wood into one pan and clay lumps into another. Obtain and record the wet weights to the nearest 0.01 lb. Record the wet weight of wood as A and the wet weight of clays lumps as B on the worksheet (Figure 1).

B. Other Deleterious Materials
   1. After removal of wood and clay lumps, oven dry the sample to constant weight at 230 ± 9°F (110 ± 5°C).
   2. Select the representative portion given in Step III (B) in accordance with DOTD TR 108.
   3. Weigh and record the weight of the dried representative portion as T_d to the nearest 0.1 g (Figure 1).
   4. Spread the dried material in a thin layer on a clean dry surface of sufficient area so that the individual particles can be visually inspected.

5. Using Table 1 as an aid, identify and separate each type of deleterious material from the remainder of the dried representative portion by placing in separate sample pans.
6. Obtain the dry weight of each type of deleterious material to the nearest 0.1 g. Record these weights as C, D, E, F, and G on the worksheet.
7. Determine the percentage of each type of deleterious material and record as H, I, J, K, L, M, and N on the worksheet.

V. Calculations

A. Calculate the percent of wood and clay lumps (P_W) in the sample to the nearest 0.01% using the following formula:

$$P_W = \left(\frac{X_W}{T_W}\right) \times 100$$

where,

X_w = wet weight of wood (A) or clay lumps (B), lb
T_w = wet weight of total sample, lb
100 = constant

example:

X_w = 0.01 lb (wood)
T_w = 34.29 lb (total sample wt)

$$P_W = \left(\frac{0.01}{34.29}\right) \times 100$$

$$= 0.00029 \times 100$$
$$= 0.03\%$$

B. Calculate the percent of each other type of deleterious material (P_d) to the nearest 0.1% using the following formula:

$$P_d = \left(\frac{X_d}{T_d}\right) \times 100$$

where:

X_d = dry weight of deleterious material, g (C, D, E, F, or G)
T_d = dry weight of representative portion, g
100 = constant

example:

X_d = 42.3 g (friable particles)
T_d = 1960.8 g (representative portion)

$$P_d = \left(\frac{42.3}{1960.8}\right) \times 100$$

$$= 0.02157 \times 100$$
$$= 2.2\%$$

C. Calculate the total percentage of clay lumps and friable particles by adding the percent clay lumps (I) and the percent friable particles (J).
D. Calculate the total percentage of clay lumps and friable particles, iron ore, coal and lignite, and wood by adding the percent wood (H), clay lumps (I), friable particles (J), coal and lignite (K), and iron ore (N).

VI. Report

A. Report the percentages of wood and clay lumps to the nearest 0.01% on the Deleterious Materials in Aggregate Worksheet
B. Report the percentages of all other deleterious materials to the nearest 0.1% on the Deleterious Materials in Aggregate Worksheet.
C. Report percentages of all deleterious materials on the Aggregate Test Report.

VII. Normal Reporting Time

Normal test reporting time is 2 days.

TABLE 1

DELETERIOUS MATERIALS

WOOD – Vegetable matter including bark, sticks and roots.

CLAY LUMPS – Any particle predominantly composed of clay that can be broken into finely divided particles with the fingers while damp.

FRIABLE PARTICLES – Any particle other than clay that can be broken into finely divided particles with the fingers.

COAL AND LIGNITE – Lightweight black or brownish black particles formed by the decomposition of vegetable matter. Lignite is a low grade of coal in which the texture of the original wood is distinct.

FLAT OR ELONGATED PARTICLES – Particles having lengths equal to or greater than five times their average thickness.

GLASSY PARTICLES – Particles of slag having a slick, smooth, glassy finish on any surface.

IRON ORE – Rough textured, soft, yellow, brown, or black porous particles (called limonite) or hard, dark reddish or brown conglomerate particles (called hematite).

DOTD 03-22-0746
Rev. 04/09

State of Louisiana
Department of Transportation and Development

DELETERIOUS MATERIALS IN AGGREGATE
(DOTD TR 119)

Material: _____ State Project No. 999-99-9999

Lab No: 22-999999 Sample No. _____

DELETERIOUS MATERIAL	Total Sample Wt., lb (g) (T_W) 34.29 Representative Portion, g (T_d) 1960.8		WEIGHT	PERCENT OF DELETERIOUS MATERIALS	
WOOD	$H = (A / T_W) \times 100$	A	0.01	H	0.03
CLAY LUMPS	$I = (B / T_W) \times 100$	B	0.01	I	0.03
FRIABLE PARTICLES	$J = (C / T_d) \times 100$	C	42.3	J	2.2
CLAY LUMPS & FRIABLE PARTICLES				I + J	2.2
COAL & LIGNITE	$K = (D / T_d) \times 100$	D	10.7	K	0.5
FLAT OR ELONGATED PARTICLES	$L = (E / T_d) \times 100$	E	29.0	L	1.5
GLASSY PARTICLES	$M = (F / T_d) \times 100$	F	15.1	M	0.8
IRON ORE	$N = (G / T_d) \times 100$	G	31.6	N	1.6
TOTAL: (Wood, Clay Lumps & Friable Particles, Coal & Lignite, and Iron Ore				H+I+J+K+N	4.4

Intended Use: _____

Remarks: _____

Tested By: D.B. Date: 6-24-09

Checked By: S.T. Date: 6-24-09

Approved By: Lab Eng. Date: 6-25-09

Figure 1

MATT MENU SELECTION - 2

Louisiana Department of Transportation and Development

AGGREGATE TEST REPORT

DOTD 03-22-0745
Metric / English
Rev. 11/98

Metric / English E (M or E - Located on MATT Menu)

Project No. 9999-999-999999

Date Sampled 06-12-31-09

Purp Code

Source Code

Date Tested --

Item No. ( )

Material Code

Submitted By

Spec Code

Ident

Plant Code

Lab No. 2121-999999999

Quantity

P.O. No.

Frict.Rating (1-4)

Date Rec'd (lab)

Sampled By:

Remarks 1

Tested By P.B. Date 6-24-09 Checked By S.T. Date 6-24-09

DOTD TR 102, 112, 113 & 309

Unit 1 = grams 2 = pounds

mm	Sieve in.	Mass (Wt) Retained	% Retained	% Coarser	% Passing
63	2 1/2				
50	2				
37.5	1 1/2				
31.5	1 1/4				
25.0	1				
19.0	3/4				
16.0	5/8				
12.5	1/2				
9.5	3/8				
4.75	No. 4				
Mass (Wt) Matl.in Pan					
Accum. Total					

Initial Dry Total Mass, (Wt) % Diff:

Unit 1 = grams 2 = pounds

mm/µm	Sieve No.	Mass (Wt) Retained	% Retained	% Coarser	% Passing
2.36	8				
2.00	10				
1.18	16				
600	30				
425	40				
300	50				
180	80				
150	100				
75	200				
53	270				
Mass (Wt) Matl.in Pan					
Decant Loss					
Accum. Total					

Initial Dry Total Mass, (Wt) % Diff:

Dry Mass (Wt) After Wash

Remarks 2:

DOTD TR 428

Liquid Limit Plastic Limit

No. of Blows		Mass Cup + Wet Soil,g	
Mass Cup + Wet Soil,g		Mass Cup + Dry Soil,g	
Mass Cup + Dry Soil,g		Mass Water	
Mass Water		Cup No.	
Factor		Mass Cup, g	
Cup No.		Mass Dry Soil	
Mass Cup, g		% Moisture	
Mass Dry Soil			
% Moisture		Plasticity Index	

Absorption, % (T84 or T85)	
Spec Grav SSD (T84 or T85)	
Spec Grav APP (TR 300)	
Effective Spec Grav (TR 300)	
Opt Moist Content, % (TR 418)	
Maximum Density (TR 418) kg/m³ (lb/ft³)	
Lab Comp Method (TR 418)	
Cement, % (TR 432 or SPECIFIED)	
Lime, % (TR 416 or SPECIFIED)	
Other (Additive) Code %	
Clay Lumps, % (TR 119)	0.3
Friable Particles, % (TR 119)	2.2
Clay Lumps & Friable Particles % (TR 119)	2.2
Flat or Elongated Part, % (TR 119)	1.5
Coal & Lignite, % (TR 119)	0.5
Glassy Particles, % (TR 119)	0.8
Iron Ore, % (TR 119)	1.6
Wood, % (TR 119)	0.3
Total (Clay Lumps, Fri.Part., Iron Ore, Coal & Lignite, Wood), % (TR 119)	4.4
Foreign Matter, % (TR 109)	
Clam Shell, % (TR 110)	
Soundness, % Loss (T 104)	
Abrasion, % Loss (T 96)	
Colorimetric Test (1 = Pass, 2 = Fail) (T 21)	
Asphalt Content, % (TR 307)	
Retained Asphalt Coating, % (TR 317)	
Percent Crushed (TR 306)	
Retained Marshall Stability (TR 313)	
Resistivity, ohm - cm (TR 429)	
pH (TR 430)	
Organic Content, % (TR 413)	
Sand Equivalent (TR 120)	

Approved By: LAB. ENGR. Date: 6-24-09

Figure 2